Comparison of the storage stability of starch and pectin black raspberry confections

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Introduction

Black raspberries (BRB) have draw food scientists attention due to their rich source of bioactive phytochemicals and nutrients that have promising anticancer effect, such as anthocyanins and ellagitannins. As reported, they may be involved in inhibiting chronic inflammatory processes which are associated with the initiation and promotion of cancer in various organs[1]. However, due to the instability of these compounds during production process and storage, a suitable food matrix need to be carefully designed so that these bioactives can be stored, delivered and released at desirable rate. Polymer gels formed by starch or pectin have 3-dimensional network that can protect and entrap these bioactives for targeted delivery[2]. Total water content, water activity (Aw), texture, and rheological properties are some of the most important factors in qualifying physicochemical stability of a product. The consistency of these properties may changed during product storage and this can lead to serious safety problem, affect quality acceptability and influence the function of delivery.

The objective of this study is to assess the physicochemical stability of two different BRB matrices: Starch and pectin based gummies, under different storage temperature conditions for two months

Materials & Methods

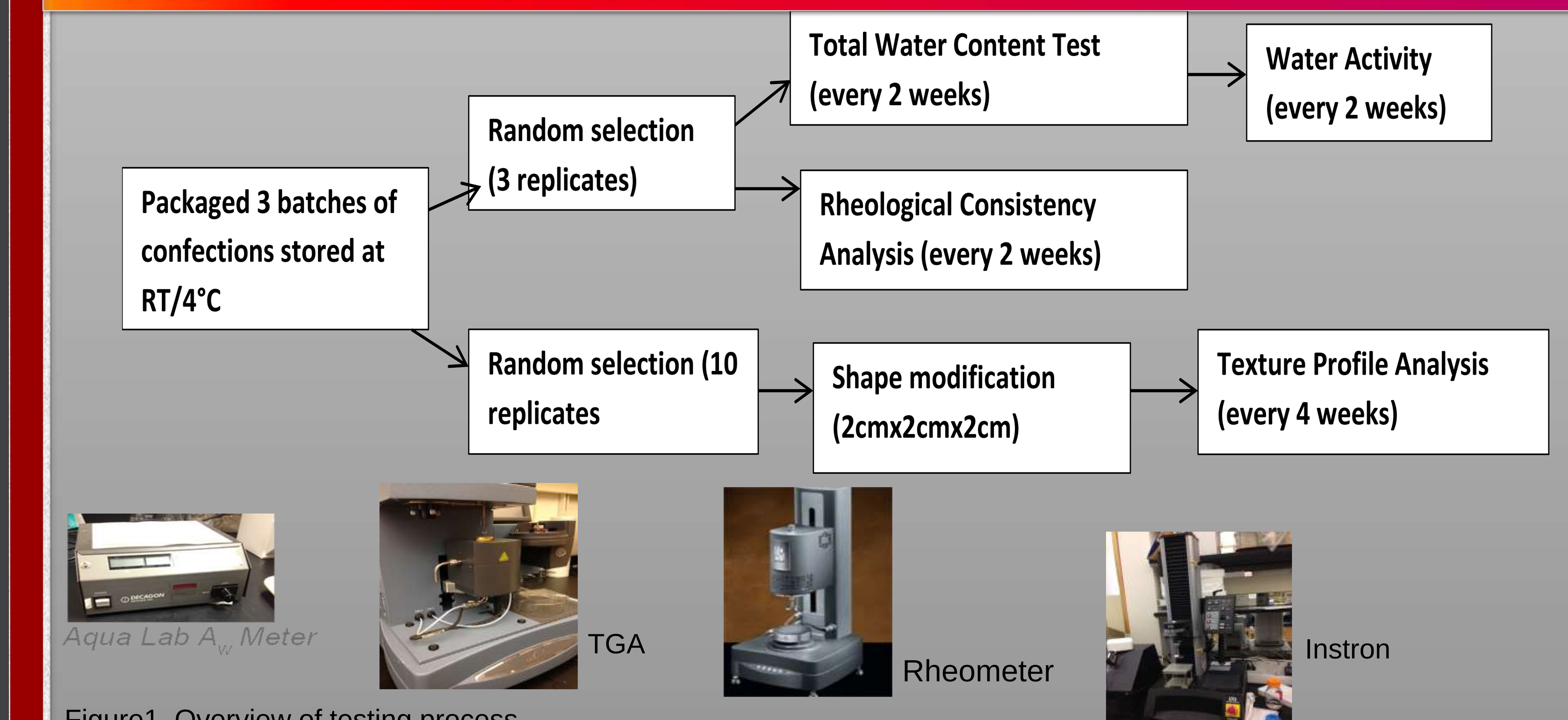


Figure1. Overview of testing process

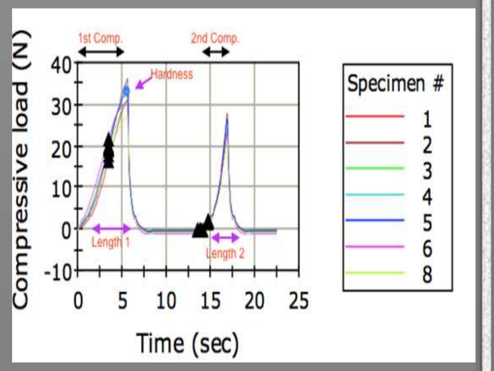
Total Water Content and Water Activity

A Thermogravimetric Analyzer, TGA Q-5000, was used to determine the total moisture content of each confections. 15-20 mg sample were selected from the middle section of each replicates and then analyzed with a heating rate of 10.00° C/min and a final temperature of 200℃.

Lower Aw is one of the factors that contributes to a longer shelf life.

Rheological Consistency

Confections were analyzed with an AR 2000ex Controlled Stress Rheometer with a 20 mm diameter probe. Elasticity (G') was recorded and compared by dynamic frequency sweep (0.1−100 Hz) tests carried out at 25℃ with 0.1% strain to obtain viscoelastic behavior of confections.



Sample graph of **TPA**

Texture Profile Analysis (TPA)

Confections' texture was characterized by a Instron Texture Analyzer. Hardness, springiness, cohesiveness, gumminess and chewiness were measured and analyzed

Results

Water Content and Water Activity

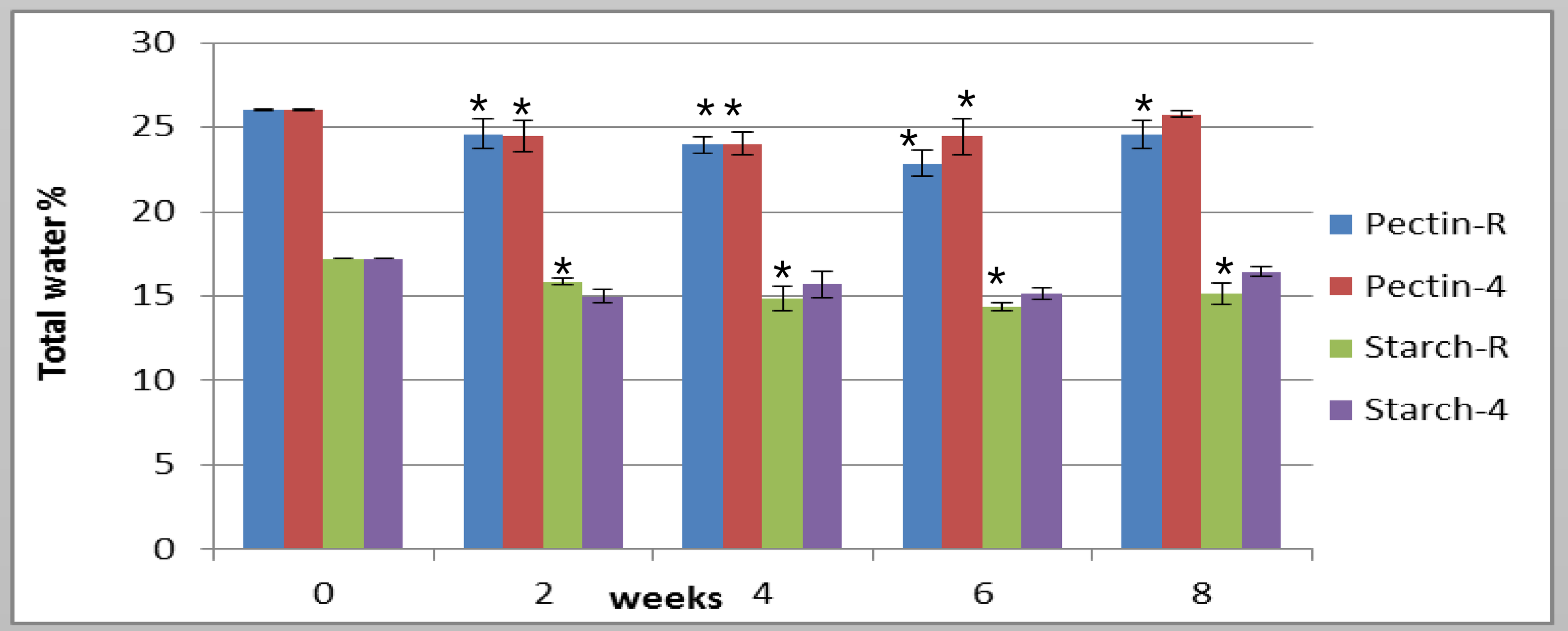


Figure2. Total Water content change of Pectin and Starch confections from fresh to 8 weeks

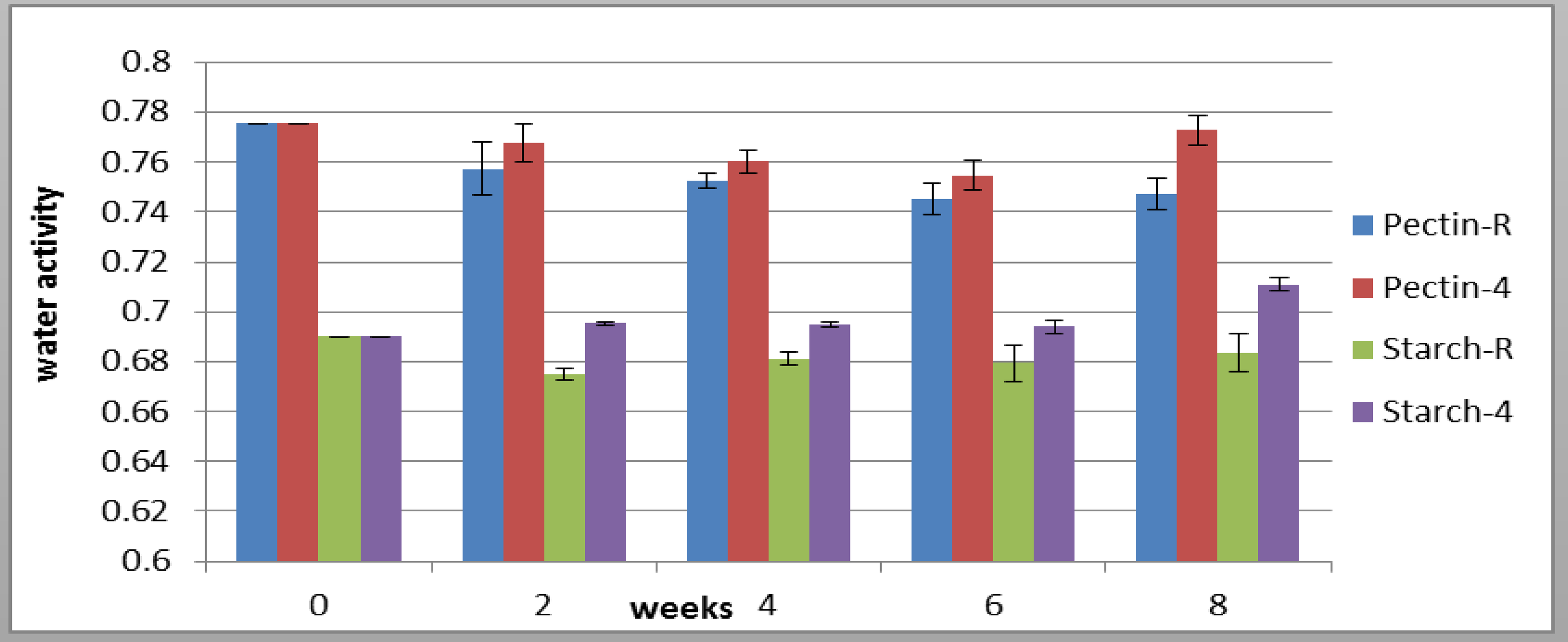


Figure3. Aw change of Pectin and Starch confections from fresh to 8 weeks

Rheological Consistency

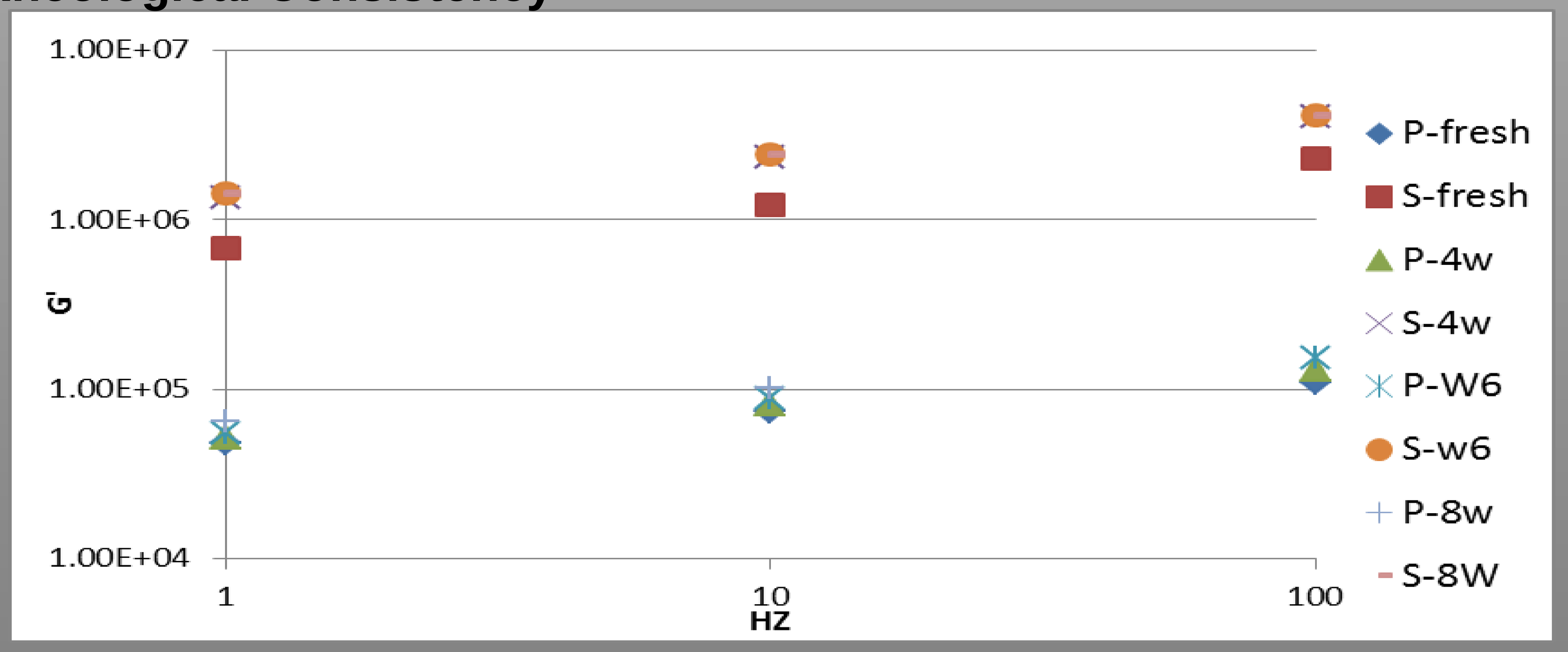


Figure4. G' of Pectin vs Starch Gummy at RT from fresh to 8week- storage(1-100Hz) in log scale

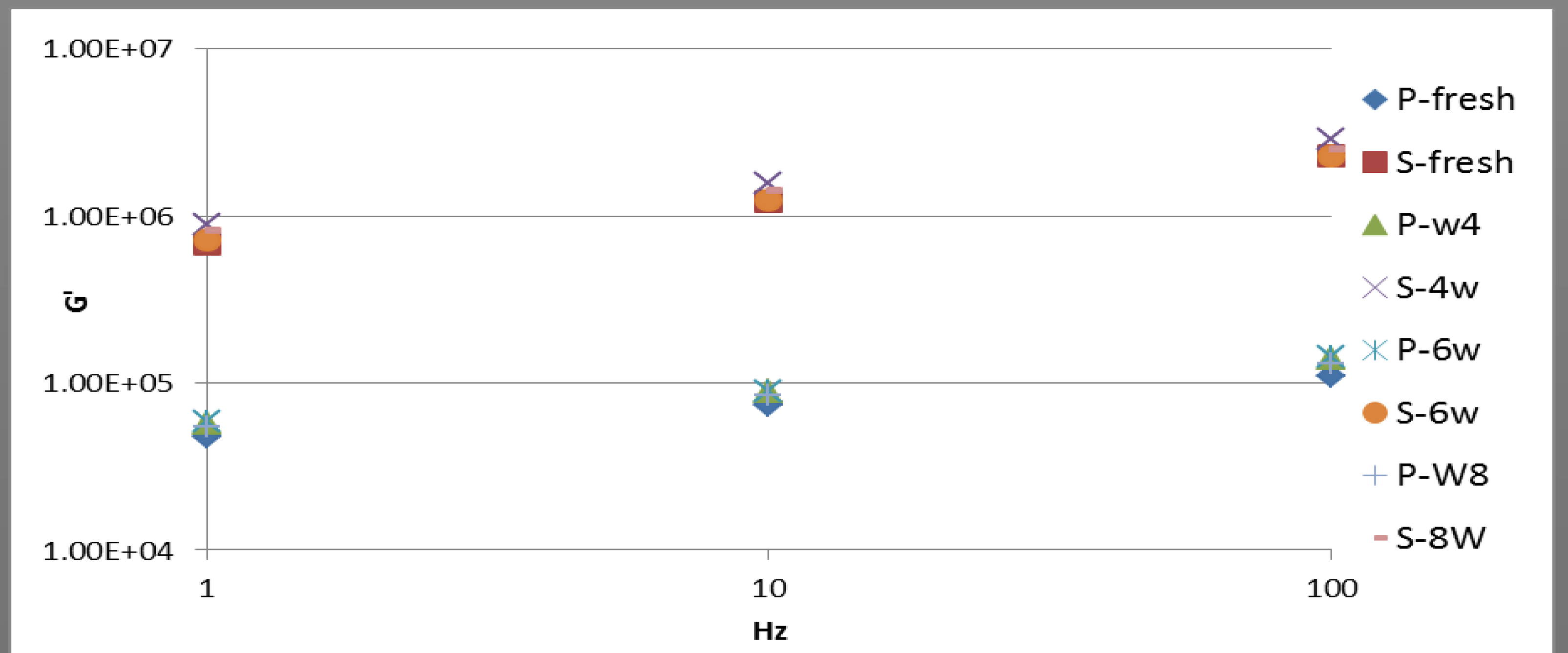


Figure5. G' of Pectin vs Starch Gummy at 4℃ from fresh to 8week- storage(1-100Hz) in log scale

Texture Profile Analysis

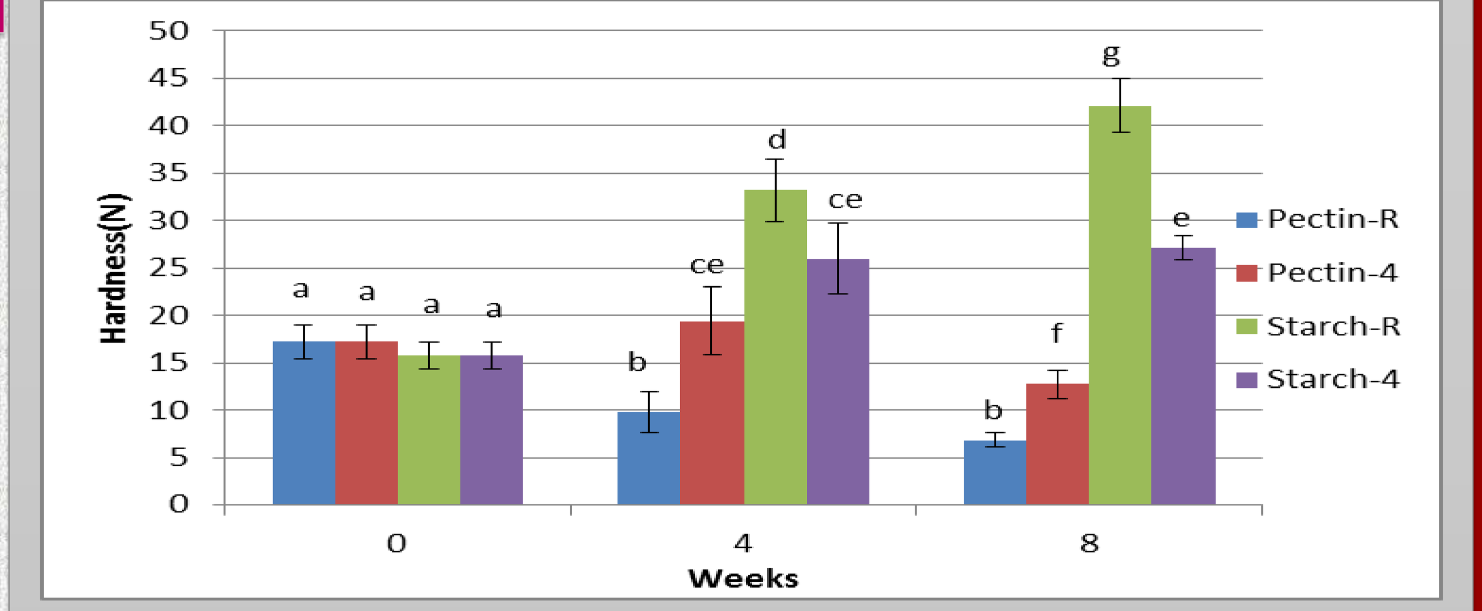


Figure7. The Hardness of Pectin and Starch confections from fresh to eight weeks under room temperature and 4℃

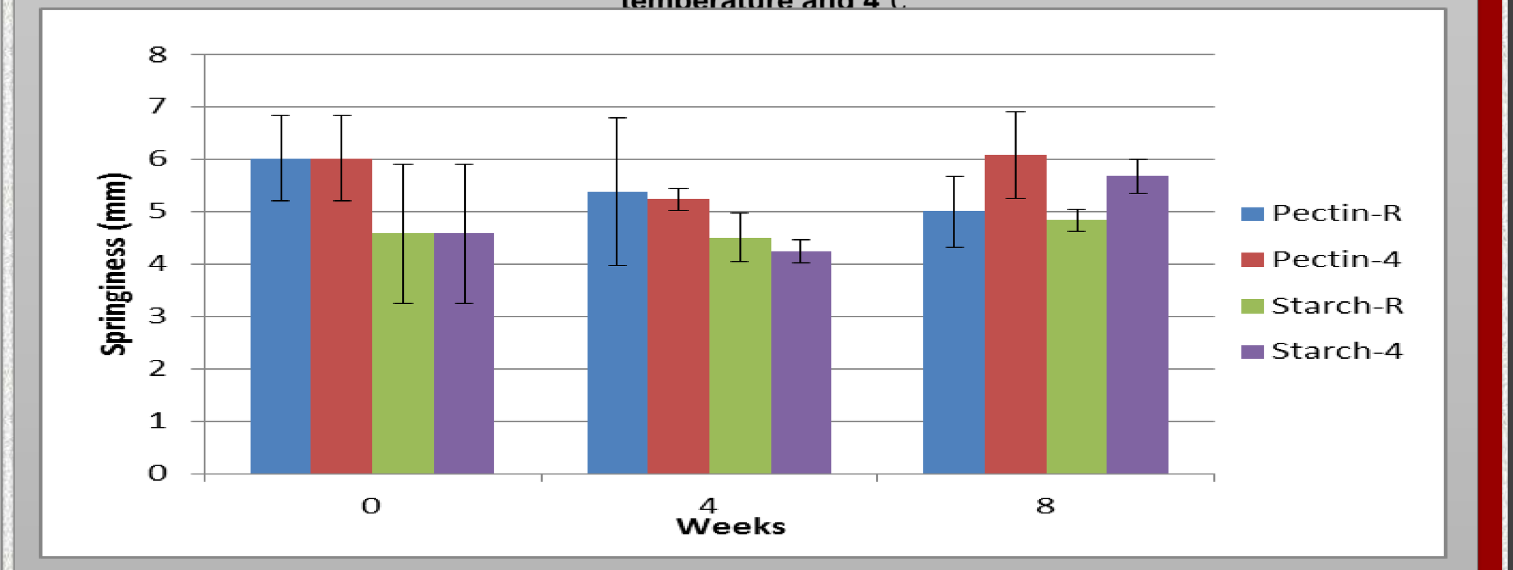


Figure8. The Springiness of Pectin and Starch confections from fresh to eight weeks under room temperature and 4℃

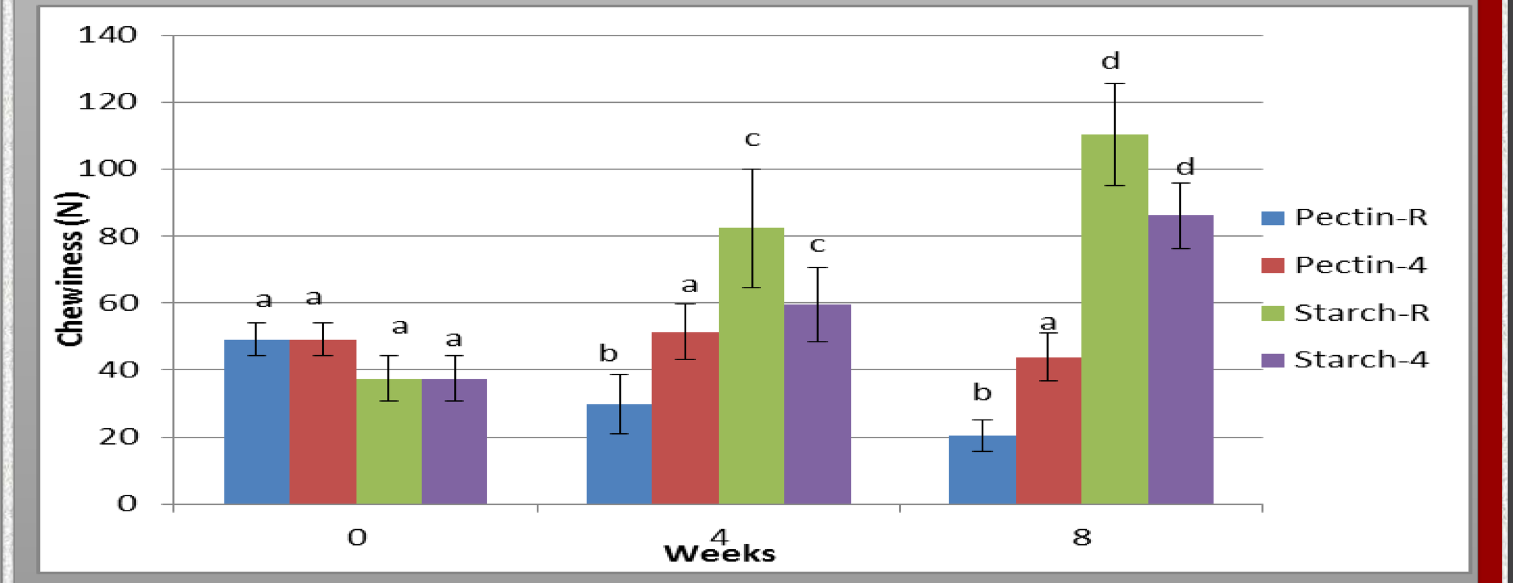


Figure9. The Chewiness of Pectin and Starch confections from fresh to eight weeks under room temperature and 4℃

Conclusion

- Total water Content:

Starch gummy at 4℃ storage reduced the overall water loss and helped to maintain total water content for two months (P>0.05). Pectin gummy changed in total water content for both condition

- Water activity:

Starch gummy had Aw< 0.7, and Pectin gummy had Aw> 0.7. Both confections had Aw<0..8

- Elasticity (G'):

Starch gummy stored at room temperature had significant increase (p<0.05), indicating a more solid like structure with increasing storage time.

Pectin gummy stored at both conditions shown no significant change (p>0.05)

- TPA

Pectin gummy had lower hardness and chewiness, and higher springiness than starch gummy.

Reference

1.Gu, J., Ahn-Jarvis, J. H., Riedl, K. M., Schwartz, S. J., Clinton, S. K., & Vodovotz, Y. 2014. Characterization of black raspberry functional food products for cancer prevention human clinical trials. J Agri Food Chem, 62: 3997-4006.

2.Yu L. 2001. Amorphous pharmaceutical solids: preparation, characterization and stabilization. Adv Drug Deliver Rev 48:27–42